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(54) Abstract Title

**Depilatory compositions**

(57) A depilatory composition comprising a continuous aqueous phase, a depilatory agent and an oil phase comprising a non-polar oil separated from the continuous phase by a bilayer phase comprising a surfactant and a polar substance. The composition is substantially free from tertiary amines and the polar substance is one or more of polypropylene oxide-15 stearyl ether, olive oil, macadamia nut oil, avocado oil, calendula oil, wheatgerm oil and cyclomethicone. Suitable surfactants include cetearyl phosphate, cetearyl alcohol, cetearyl glucoside, cetostearyl alcohol and cetareth 20. Suitable non-polar oils include thick mineral oil, sweet almond oil, isohexane, sunflower seed oil, apricot kernel oil and shea butter. The non-polar oil may be present in the form of droplets. The composition may optionally include an accelerator to accelerate keratin reduction, a pH regulator and a clay.

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Depilatory Compositions and their use

The present invention relates to depilatory compositions in the form of an improved oil-in-water emulsion; and in particular their preparation, and their use in degrading hair keratin.

Compositions for removing superfluous body hair are well known and are of various types. One type of composition requires initial heating before being applied to the skin in a generally molten state. It is then allowed to solidify before being removed from the skin together with unwanted hair.

Another type of depilatory composition is in the form of a cream, which can be applied to the skin at room temperature. The cream includes a substance that degrades hair keratin. Such substances tend to irritate the skin which is a problem for users with sensitive skin. Compositions with reduced irritancy have been sought.

According to the present invention there is provided a depilatory composition which comprises:

- (a) a continuous aqueous phase;
- (b) a depilatory agent; and
- (c) an oil phase comprising
  - (i) a non-polar oil separated from the continuous aqueous phase by a bilayer phase comprising
  - (ii) a surfactant; and

(iii) a polar substance;

wherein the composition is substantially free from tertiary amines; and wherein the polar substance is polypropylene oxide-15 stearyl ether, olive oil, macadamia nut oil, avocado oil, calendula oil, wheat germ oil or cyclomethicone, or a mixture thereof.

Preferably the depilatory composition comprises from 2% to 6% w/w of depilatory agent, from 0.2% to 20% w/w of non-polar oil, from 2% to 20%w/w of surfactant, from 0.5% to 20% w/w of polar substance and from 95.3% to 34% w/w of aqueous phase.

The depilatory agent is a substance capable of degrading keratin and may be, for example, a sulphur compound such as potassium thioglycolate, dithioerythritol, thioglycerol, thioglycol, thioxanthine, thiosalicylic acid, N-acetyl-L-cysteine, lipoic acid,  $\text{NaHSO}_3$ ,  $\text{Li}_2\text{S}$ ,  $\text{Na}_2\text{S}$ ,  $\text{K}_2\text{S}$ ,  $\text{MgS}$ ,  $\text{CaS}$ ,  $\text{SrS}$ ,  $\text{BaS}$ ,  $(\text{NH}_4)_2\text{S}$ , sodium dihydrolipoate 6, 8-dithiooctanoate, sodium 6, 8-dithiooctanoate, salts of hydrogen sulphide for example  $\text{NaSH}$  or  $\text{KSH}$ , thioglycolic acid, thioglycerol, 2-mercaptopropionic acid, 3-mercaptopropionic acid, thiomalic acid, ammonium thioglycolate, glyceryl monothioglycolate, monoethanolamine thioglycolate, monoethanolamine thioglycolic acid, diammonium dithiodiglycolate, ammonium thiolactate, monoethanolamine thiolactate, thioglycolamide, homocysteine, cysteine, glutathione, dithiothreitol, dihydrolipoic acid, 1,3-dithiopropanol, thioglycolamide, glycerylmonothioglycolate,

thioglycolhydrazine, keratinase, hydrazine sulphate, hydrazine disulphate triisocyanate, guanidine thioglycolate, calcium thioglycolate and/or cysteamine.

- 5           However, the composition is preferably substantially or, more preferably, completely free from depilatory agents that destroy the thermodynamic equilibrium or the surface tension of the composition; examples of such agents include alkali metal sulphides.
- 10          Preferably, the composition comprises from 2.0% to 6.0% w/w of the keratin-degrading substance in order to obtain a satisfactory depilation time of about 5 minutes.

- 15           It is preferred that the non-polar oil is in the form of droplets, although it may also be in the form of sheets. When in the form of droplets, each droplet of the non-polar oil is preferably individually surrounded by one or more than one bilayer. When in the
- 20          form of sheets, each sheet of the non-polar oil is preferably separated from the adjacent sheet by one or more than one bilayer. More preferably, each bilayer, in the case where more than one is present, is itself separated by a bilayer aqueous phase comprising at
- 25          least water and depilatory agent.

- The non-polar oil preferably has a polarity index of from 20 to 46 mN/m, more preferably from 30 to 46 mN/m. The polarity index is a measure of the
- 30          interfacial surface tension between oil and water. This term is defined and explained in Principles of colloid

and surface chemistry, Paul C Hiemenz (2nd edition, Marcel Dekker 1986) incorporated herein in its entirety.

5        Suitable non-polar oils include thick mineral oils  
e.g. paraffin oil, sunflower seed oil, sweet almond  
oil, isohexane, apricot kernel oil, and/or shea  
butter. The non-polar oil and the polar substance are  
preferably miscible i.e. a mixture containing 50% of  
10 each should exhibit no phase separation. When the non-  
polar oil is in the form of droplets, these preferably  
have a diameter of from 0.01 $\mu$ m, preferably from 0.1 $\mu$ m,  
to, preferably 10 $\mu$ m, more preferably 1 $\mu$ m, most  
preferably 0.5 $\mu$ m. Preferably, the composition comprises  
15 from 0.2% to 20% w/w, more preferably from 0.2% to 4%,  
most preferably from 0.5% to 2% w/w of the non-polar  
oil.

The surfactant and oils in the oil phase are  
20 preferably chosen so that the Required Hydrophilic-  
Lipophilic Balance (RHLB) value of the total oil phase  
is of the order of the Hydrophilic-Lipophilic Balance  
(HLB) value of the surfactant. Preferred compositions  
of this invention are wherein the RHLB value of the  
25 total oil phase and the HLB value of the surfactant are  
substantially equal. The HLB value is a measure of the  
hydrophile-lipophile balance as discussed in  
Encyclopedia of Emulsion Technology, edited by Paul  
Becher (pages 217-220, volume 1(1983), Marcel Dekker)  
30 incorporated herein by reference in its entirety. The  
RHLB is explained in Encyclopedia of Emulsion

Technology, edited by Paul Becher (pages 353-366, volume 1 (1983), Marcel Dekker) incorporated herein by reference in its entirety.

5 Preferably, the RHLB value of the total oil phase and the HLB value of the surfactant are each independently from 9 to 12, more preferably from 10 to 11, especially about 10. The polar substance preferably has an RHLB value of from 7 to 16.

10 In general the surfactant is anionic, cationic or non-ionic. It is preferably non-ionic. Examples of suitable surfactants include cetearyl phosphate, cetearyl alcohol, cetearyl glucoside, cetostearyl alcohol and/or ceteareth 20. It is preferably present  
15 in an amount of from 2.0% to 20% w/w, more preferably from 2.0% to 10% w/w, most preferably from 3% to 8% w/w.

The polar substance preferably has a polarity  
20 index of from 2 to 15 mN/m, more preferably from 2 to 8 mN/m. The polar substance preferably is a polypropylene oxide-15 stearyl ether, such as, that known under the trade designation Arlamol E of ICI Ltd., having a  
25 polarity index of about 5.2 mN/m. More preferably the polar substance is a polar oil. Other suitable polar substances are olive oil, macadamia nut oil, avocado oil, calendula oil, wheat germ oil, and/or cyclomethicone optionally admixed with polypropylene  
oxide-15 stearyl ether.

30

Preferably, the composition comprises from 0.5 to 20.0% w/w, more preferably from 0.5 to 2%, most preferably from 0.4 to 1% w/w of the polar substance.

5        Optionally, the composition includes an accelerator that will accelerate the keratin degradation reaction such as urea, thiourea, dimethyl isosorbide (DMI), ethoxydiglycol (Transcutol) or methyl propyl diol (MP diol). Preferably the accelerator is  
10        urea or methyl propyl diol. The composition according to the invention preferably comprises from 5% to 15% w/w, more preferably about 8% w/w of an accelerator.

It is particularly preferred for the composition  
15        further to comprise a pH regulator to assist in activating the depilatory agent. Preferably the quantity and type of pH regulator is chosen to maintain the pH of the composition at a value greater than 5, preferably greater than 7, more preferably in the range  
20        of from 8 to 13, most preferably in the range of from 12 to 12.5, especially about 12. For example, by ensuring that the pH is about 12.1 to 12.5, depilation can occur within about 5 minutes, as desired by the user, without causing undue irritation.

25

The pH regulator preferably is in the aqueous phase (between the oil droplets) when present. Examples of the pH regulator include arginine (especially L-arginine), silicates (e.g. sodium or potassium  
30        silicate), lime and/or polyethyleneimine. It is particularly preferred for the pH regulator also to

include lime in an amount of, for example, up to 3% w/w. It is preferred, in order to minimise irritation, for the total content of the pH regulator to be present as less than 3% w/w, more preferably 0.5 to 3% w/w.

5

In a particularly preferred embodiment of this invention, the depilatory composition includes, combination, L-arginine, lime, urea, potassium and/or dipotassium thioglycolate, the polar substance and the non-polar oil and aqueous phases.

The composition of the invention may be formulated into a cream by admixture with a conventional cream base, such as a mixture of polypropylene glycol ester and cetostearyl alcohol. The formulation may also include other ingredients that are conventionally present in depilatory formulations, such as perfumes, oils, and pigments and fillers such as a clay, for example, sodium magnesium silicate, magnesium trisilicate and titanium dioxide. The inclusion of a clay, preferably sodium magnesium silicate, more preferably in an amount of from 0.1 to 10% w/w, most preferably from 0.1 to 1% w/w is particularly advantageous, since this provides sodium and magnesium ions for the buffer system and improves the efficiency of depilation.

The admixture is preferably effected under conditions of agitation sufficient to aid mixing but insufficient to cause turbulence, more preferably by mechanical means, such as stirring. Most preferably



the admixture is carried out under conditions having a Reynold value of from 0 to 2000 when the reaction is carried out in a pipe and of from 0 to 10 when the reaction is carried out in a reactor vessel.

- 5 Preferably the Reynold value is as low as possible. The Reynold value is explained in Althaus, Jakubith Chemistry and Chemical Engineering, memofix 1993 by VCH verlagsgesellschaft.

- 10 The depilatory agent is preferably not added until after the oil and aqueous phases have been mixed and gently cooled, for example, to about 30° to 40°C, preferably about 35°, to prevent degradation of the depilatory agent (which occurs at substantially  
15 elevated temperatures). Any option ingredients may be added thereafter; however it is preferred for the clay to be added when the mixing is carried out at an elevated temperature.

- 20 Without wishing to be bound by any particular theory as to the manner in which the preferred depilatory compositions function, it is believed that the oil phase is in the form of discrete droplets enveloped in a bilayer structure comprising molecules  
25 of the polar substance sandwiched between molecules of the surfactant. Such bilayer structures are then separated from each other by the continuous aqueous phase (i.e. bilayer aqueous phase) to form a multi-bilayer structure. About 30 to 50% w/w of the keratin-  
30 degrading substance tends to be embedded in the surface of this multi-bilayer structure, with the remainder

being in the aqueous phase. The embedded keratin-degrading substance is released from the multi-bilayer structure only as it is needed for depilation. Thus, when the keratin-degrading substance in the continuous aqueous phase has been used up in the depilation process, the keratin-degrading substance embedded in the multi-bilayer structure is thermodynamically driven out by entropy and can then diffuse into the hair shaft to effect depilation. In this way, the depilatory composition acts as a reservoir of keratin-degrading substance whose release is regulated during use. Thus the composition produced by a process according to the invention has the advantage of a lower irritancy. This reduced irritancy is further improved by the absence of tertiary amines from the composition.

According to the invention there is further provided the use of a composition prepared by a process according to the invention, to degrade hair keratin.

Throughout this specification, "w/w" refers to the weight of the total composition, unless otherwise specified.

The following Examples illustrate the invention:

Example 1

A depilatory composition was prepared from the  
5 following ingredients:

<i>Ingredient composition</i>		<i>w/w total</i>
	Cetostearyl alcohol (2)	8.0%
10	Sodium magnesium silicate	1%
	Ca (OH) <sub>2</sub> (3)	0.5%
	Urea (3)	8.0%
	L-arginine(3)	2.0%
	Polyethylenimine (3)	1.0%
15	Magnesium trisilicate	0.5%
	Titanium dioxide (3)	0.33%
	Potassium thioglycolate (30%)	10.0%
	Shea Butter (1)	0.5%
	Perfume	0.5%
20	Paraffin oil (1)	3.5%
	Propylene glycol (3)	0.26%
	Acrysol 33	0.01%
	Arlamol E (4)	1.0%
	Ceteareth 20 (2)	3.0%
25	Deionised water	to
	100%	

\*Acrysol 33 is an acrylic copolymer available from Rohm & Haas.

The method is as follows: the non-polar oils (1) were heated to 60°C, the surfactants (2) added and the mixture stirred in a reactor vessel having a Reynold value of less than 10. Whilst continuing to stir, the  
5 temperature was raised to about 75°C. In the meantime, the aqueous phase ingredients (3) were added with about 50% of the water. The aqueous phase was then added, at 75°C, to the oil phase with gentle stirring, and the mixture allowed to cool slowly to 35°C. At this  
10 temperature, the active ingredient (4) was added with gentle stirring and then the remaining ingredients.

The resultant cream had a pH of 12.3 and was in the form of discrete droplets formed of the shea  
15 butter, at least some of the perfume oil and the paraffin oil, separated by a bilayer structure formed of the cetostearyl alcohol, Ceteareth 20, potassium thioglycolate, some of the propylene glycol and the Arlamol E from a continuous aqueous phase containing  
20 the remainder of the ingredients. It satisfactorily removed unwanted hair within about 5 minutes, without causing undue irritation to the skin.

Example 2

A depilatory composition was prepared according to the method used in Example 1 from the following ingredients:

	<i>Ingredient composition</i>	<i>w/w total</i>
10	Cetostearyl alcohol (2)	8.0%
	Sodium magnesium silicate (3)	1%
	Ca (OH)2 (3)	0.5%
	Urea (3)	8.0%
	L-arginine (3)	2.0%
15	Polyethylenimine (3)	1.0%
	Magnesium trisilicate (3)	0.5%
	Titanium dioxide (3)	0.33%
	Potassium thioglycolate (30%)	10.0%
	Shea Butter (1)	0.5%
20	Perfume (4)	0.5%
	Paraffin oil (1)	3.5%
	Propylene glycol (3)	0.26%
	Acrysol 33	0.01%
	Arlamol B (4)	1.0%
25	Ceteareth 20	3.0%
	Deionised water	to 100%

\*Acrysol 33 is an acrylic copolymer available from Rohm & Haas.

The composition satisfactorily removed unwanted hair within about 5 minutes, without causing undue irritation to the skin.

5

Example 3

A depilatory composition was prepared according to the method used in Example 1 from the following ingredients:

10

Ingredient composition	w/w total
Cetostearyl alcohol (2)	8.0%
Sodium magnesium silicate (3)	1%
15 Ca (OH) <sub>2</sub> (3)	0.5%
Urea (3)	8.0%
L-arginine (3)	2.0%
Polyethylenimine (3)	1.0%
Magnesium trisilicate (3)	0.5%
20 Titanium dioxide (3)	0.33%
Potassium thioglycolate (30%)	10.0%
Shea Butter (1)	0.5%
Perfume (4)	0.5%
Paraffin oil (1)	3.5%
25 Propylene glycol (3)	0.26%
Acrysol 33	0.01%
Arlamol E (4)	1.0%
Ceteareth 20 (2)	3.0%
Deionised water (3)	to 100%

30

\*Acrysol 33 is an acrylic copolymer available from Rohm & Haas.

The composition satisfactorily removed unwanted  
5 hair within about 5 minutes, without causing undue irritation to the skin.

Example 4

10 A depilatory composition was prepared according to the method used in Example 1 from the following ingredients:

	Ingredient	w/w total
15	composition	
	Cetostearyl alcohol (2)	8.0%
	Sodium magnesium silicate (3)	1.0%
	Ca (OH) <sub>2</sub> (3)	0.5%
	Urea (3)	8.0%
20	L-arginine (3)	2.0%
	Polyethylenimine (3)	1.0%
	Magnesium trisilicate (3)	0.5%
	Titanium dioxide (3)	0.33%
	Potassium thioglycolate (30%)	10.0%
25	Shea Butter (1%)	0.5%
	Perfume (4)	0.5%
	Paraffin oil (1)	3.5%
	Propylene glycol	0.26%
	Acrysol33	0.01%

15

Arlamol E (4)	1.0%
Montanov 68** (2)	5.0%
Deionised water	to 100%

5        \*Acrysol 33 is an acrylic copolymer available from Rohm & Haas.

      \*\*Montanov 68 is a mixture of cetearyl alcohol and cetearyl glucoside available from Seppic.

10       The composition satisfactorily removed unwanted hair within about 5 minutes, without causing undue irritation to the skin.



Claims

1. A depilatory composition which comprises:
- (a) a continuous aqueous phase;
  - 5 (b) a depilatory agent; and
  - (c) an oil phase comprising
    - (i) a non-polar oil separated from the continuous aqueous phase by a bilayer phase comprising
    - 10 (ii) a surfactant; and
    - (iii) a polar substance;
- wherein the composition is substantially free from tertiary amines; and wherein the polar substance is polypropylene oxide-15 stearyl ether, olive oil, 15 macadamia nut oil, avocado oil, calendula oil, wheat germ oil or cyclomethicone, or a mixture thereof.
2. A depilatory composition according to claim 1, wherein the polar substance has a polarity index of 20 from 2 to 15 mN/m.
3. A depilatory composition according to claim 1 or claim 2, comprising from 2% to 6% w/w of depilatory agent, from 0.2% to 20% w/w of a non-polar oil, from 2% 25 to 20% w/w of surfactant, from 0.5% to 20% w/w of polar substance and from 95.3% to 34% w/w of aqueous phase.
4. A depilatory composition according to one of the preceding claims, wherein the non-polar oil is in 30 droplet form within the composition.

5. A depilatory composition according to claim 4,  
wherein the non-polar oil is in the form of droplets  
having a diameter of from 0.01 to 10 $\mu$ m, in the  
5 composition.

6. A depilatory composition according to any one of  
the preceding claims, wherein the RHLB value of the  
total oil phase and the HLB value of the surfactant are  
10 each independently from 9 to 12.

7. A depilatory composition according to any one of  
the preceding claims, wherein the RHLB of the total oil  
phase and the HLB of the surfactant are substantially  
15 equal.

8. A depilatory composition according to any one of  
the preceding claims, wherein the non-polar oil has a  
polarity index of from 20 to 46 mN/m.  
20

9. A depilatory composition according to any one of  
the preceding claims wherein the non-polar oil is thick  
mineral oil, sweet almond oil, isohexane, sunflower  
seed oil, apricot kernel oil and/or shea butter.  
25

10. A depilatory composition according to any one of  
the preceding claims, wherein the surfactant is  
cetearyl phosphate, cetearyl alcohol, cetearyl  
glucoside, cetostearyl alcohol and/or Cetareth 20.  
30

11. A depilatory composition according to any one of the preceding claims, wherein the depilatory agent is potassium thioglycolate, dithioerythritol, thioglycerol, thioglycol, thioxanthine, thiosalicylic acid, N-acetyl-L-cysteine, lipoic acid,  $\text{NaHSO}_3$ ,  $\text{Li}_2\text{S}$ ,  $\text{Na}_2\text{S}$ ,  $\text{K}_2\text{S}$ ,  $\text{MgS}$ ,  $\text{CaS}$ ,  $\text{SrS}$ ,  $\text{BaS}$ ,  $(\text{NH}_4)_2\text{S}$ , sodium dihydrolipoate 6, 8-dithiooctanoate, sodium 6, 8-dithiooctanoate, salts of hydrogen sulphide for example  $\text{NaSH}$  or  $\text{KSH}$ , thioglycolic acid, thioglycerol, 2-mercaptopropionic acid, 3-mercaptopropionic acid, thiomalic acid, ammonium thioglycolate, glyceryl monothioglycolate, monoethanolamine thioglycolate, monoethanolamine thioglycolic acid, diammonium dithiodiglycolate, ammonium thiolactate, monoethanolamine thiolactate, thioglycolamide, homocysteine, cysteine, glutathione, dithiothreitol, dihydrolipoic acid, 1,3-dithiopropanol, thioglycolamide, glycerylmonothioglycolate, thioglycolhydrazine, keratinase, hydrazine sulphate, hydrazine disulphate, triisocyanate, guanidine thioglycolate, calcium thioglycolate and/or cysteamine.

12. A depilatory composition according to any one of the preceding claims, wherein the composition additionally comprises an accelerator that will accelerate a keratin reduction reaction.

13. A depilatory composition according to claim 12, wherein the accelerator is urea, thiourea, dimethyl isosorbide, ethoxydiglycol and/or methyl propyl diol.

14. A depilatory composition according to any one of the preceding claims, wherein the composition further comprises a pH regulator to maintain the pH of the composition at a value greater than 7.

5

15. A depilatory composition according to claim 14, wherein the pH regulator is arginine, silicates and/or polyethyleneimine optionally in combination with lime.

10 16. A depilatory composition according to any one of the preceding claims, wherein the composition comprises a clay in an amount of from 0.1% to 10%w/w.

15 17. A depilatory composition according to any one of the preceding claims, wherein the resultant composition is in the form of a cream.

18. Use of a depilatory composition as claimed in any one of the preceding claims, to degrade hair keratin.

20

19. A depilatory composition substantially as hereinbefore described with reference to the examples.

20. Use of a depilatory composition substantially as  
25 hereinbefore described, in the removal of hair from a human's skin.



INVESTOR IN PEOPLE

Application No: GB 0127115.4  
Claims searched: 1-20

Examiner: Dr Annabel Ovens  
Date of search: 7 February 2002

## Patents Act 1977 Search Report under Section 17

### Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.T): A5B (BFB)

Int Cl (Ed.7): A61K 7/155

Other: Online: CAS-ONLINE, PAJ, EPODOC, WPI

### Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
	NONE	

- |   |  |
|---|--|
| X Document indicating lack of novelty or inventive step   | A Document indicating technological background and/or state of the art.  |
| Y Document indicating lack of inventive step if combined with one or more other documents of same category. | P Document published on or after the declared priority date but before the filing date of this invention.          |
| & Member of the same patent family  | E Patent document published on or after, but with priority date earlier than, the filing date of this application. |

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